REMARKS

The specification is amended in accordance with examiner's suggestions as follows:

Replace the word "through" with ",4b, and" and remove the word "is" on page 16 line 16.

Add the word "respectively" after the word "c-c" on page 16 line 17.

Add the trademark symbol ® after the word "MAFIA" on page 20 line 3, after the word "XGUN" on page 20 line 4, after the word "2D" on page 20 line 17, and after the words "BOA" and "XGUN" on page 20 line 19.

Change the word "4a-c" to "4a-4c" on page 21 line 5 and page 22 line 14.

Add the word "respectively," after the word "c-c," on page 22 line 14.

Add the words "(not shown)" after the numerical reference "180" on page 24 line 19 and after the numerical reference "170" on page 24 line 20.

Drawing figures 6a, 7, and 8 are revised to change reference numeral 131 (previously used to describe the unrelated coil of figure 4a) to reference numeral 132, and

the text is amended accordingly on page 22 line 1. Duplicately used reference numeral 172 (previously used to describe resonant cavity of figure 4) is changed to 178 for cutouts on figures 6a, 7, and 8, and also in the specification on page 24 line 11.

Drawing figure 6b is revised such that the leader for reference numeral 210 points to the aperture which it references.

Incorrect reference to field generator 131 on page 21 line 24 is amended to properly refer to coil 130.

Figure 9 is revised to use reference numerals 230e, 102e, 106e, 112e, 152e, and 171, consistent with figure 4 from which is it derived.

Figure 10 is revised to change reference numeral 171 to 178.

With regard to the examiners comment that "auxiliary coil 180" of page 25 line 9 designates a different coil, applicant points out that the drawing figures 6a, 7, 8, and 10 show variants of the magnetic circuit and correction elements (including auxiliary coil 180) used to produce the magnetic circuit of the invention, and some of those elements are common to all figures, as indicated by the reference numerals. For example, the structure 180 is referred to as "An auxiliary electromagnet coil or permanent magnet 180" on page 24 line 5 when describing figure 6a, and

referred to as "auxiliary coil 180" on page 25 line 9 when referring to the same coil performing the same function on these two figures, as well as figure 7 and figure 10. Figure 8 shows this structure replaced by a permanent magnet 242 in the same location held by auxiliary coil 180. It is located in the same place on all 4 figures, and it is given the same name and reference numeral, indicating that the element is in the same location and performing the same function. Other structures, such as apertures 210, are also common to figures 6a, 7, 8, and 10. Reconsideration is requested.

With regard to the requirement for each element of each drawing figure to be referenced in the specification, applicant points out that page 20 line 23 - page 21 line 1 already indicates that "Figures 4a, 4b, and 4c show cross section views of the present invention, and may be examined in conjunction with corresponding sections a-a, b-b, and c-c of figure 4." For figures which are derived from earlier figures such as figures 6c (derived from 6b), 6a, 7, 8, 10 (derived from figure 4a), and figure 9 (derived from figure 4), a sentence is added to each paragraph discussing the figure which declares each structure by name and reference numeral where such reference numeral appears in the drawing, but not in the associated description in the specification which describes the figure. This clarification which

references the previous element referenced by the previous reference number adds no new matter to the invention.

With regard to the drawing objection for reference label 174 to be provided in figure 4a, applicant points out that from figure 4, it can be seen that figure 4a is a section view of a-a, which occurs outside the extent of resonant chamber 174, therefore the structure is not present at all in figure 4a, and the absence of a reference to this structure is proper.

With regard to the drawing objection requesting reference label 102 being added to figure 6a, applicant points out that these are structures associated with the electron gun, which is not shown in figure 6a. The drawing description of figure 6a on page 16 line 20-23 declares "Figure 6a is a three dimensional view of *the magnetic circuit* of figure 4 showing an electromagnetic coil and shaped iron structure in the gun region for reducing radial and azimuthal asymmetries at the cathode locations" (emphasis added). Applicant points out that the magnetic circuit of figure 6a is simplified to include only magnetic circuit elements related to changing the shape of the magnetic field in the region of the cathode ~~102~~, and excludes elements which do not change the shape of the magnetic field, such as the electron gun assembly in its entirety, and the emitting surface 101. Figures 6b and 6c show the relationship between the uncorrected and corrected

fields and the cathode 102 and emitting surface 101. Reconsideration is requested.

In the previous amendment of Feb 19, 2002, applicant changed the number of electron guns from 7 to 8 so that the axial and transaxial views would agree with each other. With regard to the 35 USC 132 objection of adding new matter into the disclosure, applicant points out that the specification indicates only that a "plurality of electron beams" may be summed together on page 19 line 14-16 without declaring exactly how many might be present. However, to respond to this objection, the specific reference to "n=8" is deleted on page 21 line 6, since the number of guns in the device may be any plurality, as stated multiple places in the application.

With regard to the objection of claim 25 and 26, applicant points out that electronic devices which have the characteristic of gain further divide themselves into two classes: amplifiers and oscillators. The class of devices for which there is a 360 degree total phase shift from output to input at a frequency and for which the gain from input, through the device, and back to input is greater than unity at this frequency are known as oscillators, and the class of devices for which the frequency for which the 360 degree phase shift from input to output and back to input has a gain less than unity at this frequency are known as amplifiers. This is known to anyone skilled in the art of

amplifiers and oscillators. If the device gain is less than unity at all frequencies, the device is an attenuator, and there is no utility in having electron guns, etc present, so this case is not presented in the claims. Applicant also points out that device use as an amplifier appears on page 1 line 19-20 of the present application, and by incorporation from U.S. Patent 5,932,972 which describes multi-beam electron device use as an amplifier on column 1 line 15-16. The use of devices as oscillators is discussed in Caryotakis et al, European patent office WO 97/38436 on page 1 line 23 "..devices used for the amplification of generation of high frequency electromagnetic energy", where "generation" is understood to be the function of an oscillator, as is known to one skilled in the art of oscillators and amplifiers. The Caryotakis teaching was also incorporated by reference in the present application. Reconsideration is requested.

With regard to the 35 USC 102(b) and 35 USC 103(a) rejections over Nevins, Tran, applicant has amended the rejected claims to be drawn to include both the elements of a multiple electron beam gun and specific magnetic field correction devices from the figures and specification of the application, and such magnetic field correction structures not present in these references.

With regard to the 35 USC 103(a) rejection over Mourier in view of either Nevins or Tran, applicant has amended the claims of the application to include the specific magnetic

circuit structures of the application, which are distinct from Mourier. Mourier teaches one of three field correction devices to be used in combination with a multiple-beam electron gun:

a) a main coil (24 of Mourier) providing a main field and a single correction coil (30 of figure 3 of Mourier or 44 of figure 5 of Mourier) providing radial correction to the main field, located between the two end caps having apertures (end caps 22 and 20 of Mourier, corresponding to end caps 140 and apertures 210 of the present invention)

b) a main coil (24 of Mourier) providing a main field and two correction coils 36 and 38 located coplanar to the end caps (22 and 20 of Mourier)

c) a combined system of a) and b), where there is a main coil and correction coils 44, 36, and 38 all operating together.

There is no teaching in Mourier of the following function that is accomplished by the structures of the present application: modifying the main field to create magnetic field lines which are perpendicular to the face 101 of the cathode 102, as described in figures 6b (uncorrected) and 6c (corrected). Mourier teaches removal of the radial gradient throughout the entire beam tunnel, while the structures of the present

application operate in the vicinity of the face 101 of the cathode 102.

There is no teaching in Mourier of the iron structure 170 which is located on the central axis and surrounds the electron guns including cutouts 178.

There is no teaching in Mourier of the combination of the iron structure 170 locate on the central axis surrounding the electron guns including cutouts 178 and either the auxiliary coil 180 or permanent magnet 240. In Mourier, the single coil is located at the midline of the device, not near the electron gun cathodes.

There is no teaching in Mourier of a single outer coil 232 or permanent magnet 240 near the electron gun cathodes. Mourier teaches away from this by locating the coil at the midline of the device and setting this as the best mode, which is consistent with the objective of correcting for a radial field gradient.

There is no teaching in Mourier of the combination of an inner coil magnetic return 170 and an outer coil magnetic return 260 which are activated by an inner coil 180 and an outer coil 232, these inner and outer coil returns operating principally on the flux of the cathodes 102.

The amended claims of the present invention are directed to the structures described in the specification and figures of the present invention, and

are not present in Mourier or in combination with the multiple beam electron guns.

New claims 27-32 are added and draw on the magnetic circuits of the invention, and are distinguishable from the prior art as they recite the flange of the present invention which is not found in prior art.

Version with markings to show changes made

The following claims are amended as follows:

1(Amended) A multiple beam RF device comprising:

a housing having a central Z axis, said housing enclosing a plurality of electron beam tunnels, each said beam tunnel having a conductive inner surface, and each said beam tunnel further comprising a sequence of drift tubes and drift tube gaps, said beam tunnels arranged about said central Z axis of said housing, and said housing including a plurality of apertures, one said aperture for each said electron beam tunnel;

a plurality of electron guns equal to said plurality of said electron beam tunnels, each said electron gun producing an electron beam passing uniquely through one of said electron beam tunnels;

a magnetic field applied to each said electron beam, said magnetic field having a variation of less than 5% over the extent of said electron beam tunnels;

each said electron gun having a cathode for the generation of electrons, an anode for the acceleration of said electrons, and a focus electrode for the focusing of said electron beams;

a magnetic field corrector adjacent to each said electron gun cathode for correcting said magnetic field such that said cathode surface has a magnetic field which is everywhere perpendicular to said cathode surface.

3(Amended) The RF device of claim 2 wherein at least one of said drift tube gaps includes a port for the introduction of RF energy [may be introduced in at least one of said drift tube gaps], and at least one of said drift tube gaps includes a port for the removal of RF energy [may be removed from at least one of other said drift tube gaps].

6(Amended) The RF device of claim 1 wherein said magnetic field produces a confining force which exceeds the space charge forces in each said electron beam.

8(Amended) A multiple beam RF device comprising:

a housing having a central Z axis and an R plane orthogonal to said Z axis, said housing enclosing a plurality of electron beam tunnels, each said beam tunnel having a conductive inner surface, and each said beam tunnel further comprising a sequence of drift tubes and drift tube gaps, said beam tunnels arranged in said housing and parallel to said central axis Z of said housing, said drift tubes having a minimum separation distance from said central

axis Z of [a separation distance] value D;

a plurality of electron guns, each said electron gun having a cathode, said cathode having a thermoionic emitting surface for producing a respective electron beam passing through corresponding ones of said electron beam tunnels;

a magnetic field applied to each said electron beam, said magnetic field having a field variation of less than 5% over the extent of said electron beam tunnels;

each said electron gun having a cathode for the generation of [electrodes] electrons, an anode for the acceleration of said electrons, and a focus electrode for the focusing of said electron beams;

at least one [or more] magnetic field corrector[s], said field corrector modifying said magnetic field such that said magnetic field is perpendicular to each said cathode emitting surface.

9(Amended) The RF device of claim 8 wherein said magnetic field corrector comprises a single coil located near at least one said electron gun cathode, and said extent of said single coil is less than said separation distance D.

10(Amended) The RF device of claim 8 wherein said field corrector comprises a single coil located near at least one

said electron gun cathode and said extent of said coil is greater than said separation distance D.

11(Amended) The RF device of claim 8 wherein said field corrector comprises a first coil with an extent less than said separation distance D, and a second coil with an extent greater than said separation distance D, said first coil and said second coil located near at least one said electron gun cathode.

16(Amended) The RF device of claim 9[,] or 10 [, 11, or 12] wherein said field corrector comprises a permanent magnet.

17(Amended) The RF device of claim 9[,] or 10 [, 11, or 12,] wherein said corrector comprises non-magnetized iron.

18(Amended) The RF device of claim 9 [,] or 10 [, 11, or 12,] wherein at least one of said correction coils comprises a coil of current-carrying wire which produces said correction field.

19(Amended) The RF device of claim 9 [,] or 10 [, 11, or 12,] wherein at least one of said correction coils comprises a permanent magnet.

27 (New Claim) A magnetic circuit for influencing the trajectories of a plurality of electron beams, said magnetic circuit comprising:

a cylindrical enclosure having a central axis and a first end cap having a plurality of apertures for the introduction of a plurality of electron beams and a second end cap for the removal of said electron beams, each said beam starting from a thermionic cathode;

a main field generator producing a magnetic field perpendicular to said central axis;

a circularly symmetric flange located on said central axis, said flange having a small diameter part for the disposition of a magnetic field generator and a large diameter part for introducing said field proximal to at least one of said cathodes;

optionally, additional magnetic field correctors.

28 (New Claim) The magnetic circuit of claim 27 where said magnetic field generator is a coil wound about said small diameter.

part

29 (New Claim) The magnetic circuit of claim 27 where said magnetic field generator is a circular permanent magnet.

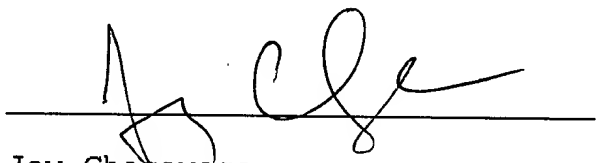
30 (New Claim) The magnetic circuit of claim 27 where said additional magnetic field correctors includes a supplemental circular field generator located on the outer surface of said first end cap, having a center on said central axis, and having a diameter sufficient to enclose said apertures on said first end cap inside said supplemental field generator.

31 (New Claim) The magnetic field generator of claim 30 where said supplemental field generator is an electromagnetic coil.

32 (New Claim) The magnetic field generator of claim 30 where said supplemental field generator is a permanent magnet.

With this amendment, this application is in condition for allowance. Examiner is advised that agent Chesavage may be reached by telephone at 650-619-5270, or via e-mail at patents@chesavage.com

Respectfully Submitted,



Jay Chesavage

Registration No. 39,137